ME - CSE

PERI
INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)
Mannivakkam, Chennai – 600 048
(Approved by AICTE, Affiliated to Anna University & Accredited by NAAC)

Date :10.08.2024

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
1st BOARD OF STUDIES (BoS) Meeting

S.No	Name of the Member	Designation	Signature
1.	**Dr. D. Manohari,** HOD / CSE	Chairman	10/8/24
2.	**Dr. Dejey,** Associate Professor, Department of Computer Science and Engineering, Anna University, Chennai-600025.	Subject Expert - University Nominee	10/08/2024
3.	**Dr. V.Cyril Raj,** Professor, Department of Computer Science and Engineering, Dr MGR Educational & Research Institute, Chennai.	External Subject Expert – Outside the Parent University	10/8/24
4.	**Dr. J. Jean Justus,** Associate Professor, Department of Computer Science and Engineering, SRMIST, Ramapuram.	External Subject Expert – Outside the Parent University	10/8/24
5.	**Mr. B. Balamurugan,** Learning Leader, Accenture.	Industrial Expert	10/8/24
6.	**Mr. S. Karthik Raja,** Managing Director, JOKAR Creations Pvt Ltd., Chennai.	Alumnus	
7.	**Dr.R.Palson Kennedy**	Internal Subject Expert	
8.	**Mr.V.Dharma Prakash**	Internal Subject Expert	10/8/24
9.	**Ms.N.Premavathy**	Internal Subject Expert	10/8/24

PERI Institute of Technology, Chennai-48 (Autonomous) Dept. of Comp. Sci. Engg

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

BOARD OF STUDIES MEETING MINUTES

The first Board of Studies (BoS) meeting of the Department of Computer Science and Engineering was conducted on 10/08/2024 at 2.00pm (IST). The following members were present,

S.No	Name of the Faculty	Designation
1	**Dr.D.Manohari,** Associate Professor & Head, Department of Computer Science and Engineering, PERI Institute of Technology. Mannivakkam, Chennai.	Chairman
2	**Dr. Dejey,** Associate Professor, Department of Computer Science and Engineering, Anna University, Chennai-600025.	Subject Expert - University Nominee
3	**Dr. Cyril Raj,** Professor, Department of Computer Science and Engineering, Dr MGR Educational & Research Institute, Chennai.	Subject Expert from outside the Parent University
4	**Dr. J. Jean Justus,** Associate Professor, Department of Computer Science and Engineering, SRMIST, Ramapuram, Chennai..	Subject Expert from outside the Parent University

PERI Institute of Technology, Chennai-48 (Autonomous) Dept. of Comp Sci Engg

5	**Mr. B. Balamurugan,** Learning Leader, Accenture. Chennai.	Industrial Expert
6	**Mr. S. Karthik Raja,** Managing Director, JOKAR Creations Pvt Ltd., Chennai.	Alumnus
7	**Dr.R.Palson Kennedy,** Principal, PERI Institute of Technology Mannivakkam, Chennai.	Internal Subject Expert
8	**Mr.V.Dharma Prakash,** Assistant Professor Department of Computer Science and Engineering PERI Institute of Technology Mannivakkam, Chennai.	Internal Subject Expert
9	**Ms.N.Premavathy** Assistant Professor Department of Computer Science and Engineering PERI Institute of Technology Mannivakkam, Chennai.	Internal Subject Expert
10	**All faculty members**	Member

BOS 1.1 Welcome Address by the Faculty Head

- The first Board of Studies meeting of PERI Institute of Technology commenced with a welcome address by Dr. D.Manohari, CSE, Faculty Head.
- Principal and Vice Principal of PERI Institute of Technology, Faculty Heads, Faculty of CSE department were present in the meeting.

BOS 1.2 Introduction About the Department

- A presentation was made by the Faculty Head about the department, highlighting the Vision and Missions of the Institution, Chairman's Message ,Department level achievements, Faculty level achievements, Student achievements etc.,

PERI Institute of Technology, Chennai-48 (Autonomous) Dept. of Comp. Sci. Engg

BOS 1.3 **Introduction about the Members of the Council**

- The Board of Studies Members who were Subject Experts from outside the Parent University, University Nominee, Industrial Expert, and Post Graduate Meritorious Alumnus, were introduced by Faculty Head.

BOS 1.4 **To consider and approve the Curriculum and Syllabi up to 4th Semester of the PG Course, in the Faculty of CSE, to be introduced in the Autonomous Institution with effect from the Academic Year 2024 – 2025 onwards**

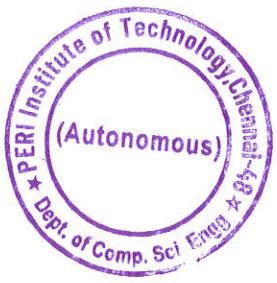
RESOLVED TO list the following Programme in the Faculty of CSE, with effect from the academic year 2024–2025.

- Listing the Postgraduate Programme, in the Faculty of CSE, for the academic year 2024-2025 was informed to the members
    - M.E - Computer Science and Engineering

BOS 1.5 **To consider and approve the Curriculum and Syllabi up to 4th Semester of the PG Course, in the Faculty of CSE, To be introduced in the Autonomous Institution with effect from the Academic Year 2024 -2025 onwards**

RESOLVED TO APPROVE the Curriculum and Syllabi up to 2nd Semester of the PG course to be introduced in the Faculty of CSE, in the autonomous Institution with effect from the academic year 2024–2025.

- The Curriculum for the PG Course up to 4th Semester was listed for approval by the Board of Studies Members.
- The Syllabi for the PG Course up to 2nd Semester was listed for approval by the Board of Studies Members
- The curriculum for all the semesters stated above were to be taken up for discussion in the Faculty of CSE Board of Studies meeting.



BOS 1.6 **Suggestions from Members for the Programme in the Faculty of CSE, to be imparted in the Autonomous Institution with effect from the Academic Year 2024 – 2025.**

The members made the following suggestions:

- Suggested to include case studies for the I Semester course Advanced software Engineering.
- In the course Network topologies, Course content can be reduced.
- Recommended to modify the course title Research Methodology and Ethics as Research Methodology.
- From Third semester onwards, journal publication can be included in evaluation process.

Resolutions in Meeting:

- **Agenda 1:** To discuss and finalize the course structure of I, II,III and IV M.E of R-24 (Autonomous) Regulations.
- **Resolutions:** Course Structure of M.E Programme of R-24 (Autonomous) Regulations is approved with minor modifications by BoS.

The meeting came to end, with Chairperson thanking all the honorable Board of Studies Members for having spared their time with valuable inputs and participated in the Faculty of CSE, First Board of Studies Meeting of PERI Institute of Technology, Mannivakkam, Chennai.

Enclosed:

Annexure I:

Department of M.E Computer Science and Engineering Curriculum.

Annexure II:

Semester - I Syllabus

Annexure III:

Semester –II Syllabus

Members Attendance

Dr. Dejey, Associate Professor, Department of Computer Science and Engineering, Anna University, Chennai Dr. DEJEY Associate Professor Department of Computer Science and Engineering College of Engineering, Guindy, Anna University, Chennai-600 025.	**Dr. V.Cyril Raj,** Professor, Department of Computer Science and Engineering, Dr MGR Educational & Research Institute, Chennai.	**Dr. J. Jean Justus,** Associate Professor, Department of Computer Science and Engineering, SRMIST, Ramapuram, Chennai.
Mr. B. Balamurugan, Learning Leader, Accenture, Chennai	**Mr. S. Karthik Raja,** Managing Director, JOKAR Creations Pvt Ltd., Chennai.	**Dr.R.Palson Kennedy,** Principal, PERI Institute of Technology, Mannivakkam, Chennai.
Mr.V.Dharma Prakash, Assistant Professor, Department of Computer Science and Engineering, PERI Institute of Technology, Mannivakkam, Chennai.	**Ms.N.Premavathy** Assistant Professor Department of Computer Science and Engineering PERI Institute of Technology Mannivakkam, Chennai.	**Dr.D.Manohari,** Associate Professor & Head Department of Computer Science and Engineering, PERI Institute of Technology. Mannivakkam, Chennai.

PERI Institute of Technology, Chennai-48 (Autonomous) Dept. of Comp. Sc. Engg.

CHAIRMAN
Board of Studies
Department of CSE
PERI Institute of Technology
(An Autonomous Institution)
Mannivakkam, Chennai - 48.

PERI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

REGULATIONS 2024

M.E. COMPUTER SCIENCE AND ENGINEERING

SEMESTER - I

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.		Applied Probability and Statistics for Computer Science Engineers	FC	3	1	0	4	4
2.		Advanced Data Structures and Algorithms	PCC	3	0	0	3	3
3.		Advanced Software Engineering	PCC	3	0	0	3	3
4.		Network Technologies	PCC	3	0	0	3	3
5.		Database Practices	PCC	3	0	0	3	3
PRACTICALS								
8.		Advanced Data structures and Algorithms Laboratory	PCC	0	0	4	4	2
9.		Software Engineering Laboratory	PCC	0	0	4	4	2
MANDATORY COURSE								
		Constitution of India	MC	2	0	0	2	0
			TOTAL	17	1	8	26	20

SEMESTER - II

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.		Research Methodology	RM	3	0	0	3	3
2.		Internet of Things	PCC	3	0	0	3	3
3.		Machine Learning	PCC	3	0	0	3	3
4.		Big Data Analytics	PCC	3	0	0	3	3
5.		Professional Elective – I	PCC	3	0	0	3	3
PRACTICALS								
7.		Data Analytics Laboratory	PCC	0	0	4	4	2
8.		Machine Learning laboratory	PCC	0	0	4	4	2
MANDATORY COURSE								
9.		Term Paper Writing and Seminar	EEC	0	0	2	2	1
			TOTAL	15	0	10	25	20

SEMESTER - III

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.		Multicore Architecture and Programming	PCC	3	0	0	3	3
2.		Security Practices	PCC	3	0	0	3	3
3.		Professional Elective-II	PCC	3	0	0	3	3
4.		Professional Elective-III	PCC	3	0	0	3	3
5.		Open Elective-I	PCC	3	0	0	3	3
PRACTICALS								
6.		Project Phase – I	EEC	0	0	12	12	6
			TOTAL	**15**	**0**	**12**	**27**	**21**

SEMESTER - IV

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.		Project Phase – II	EEC	0	0	24	24	12

PERI INSTITUTE OF TECHNOLOGY

M.E. COMPUTER SCIENCE AND ENGINEERING

PROFESSIONAL ELECTIVES

SEMESTER II, ELECTIVE I

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.		Human Computer Interaction	PEC	3	0	0	3	3
2.		Cloud Computing Technologies	PEC	3	0	0	3	3
3.		Foundations of Data Science	PEC	3	0	0	3	3
4.		Wireless Communications	PEC	3	0	0	3	3
5.		Agile Methodologies	PEC	3	0	0	3	3
6.		Performance Analysis of Computer Systems	PEC	3	0	0	3	3
7.		Advanced Operating System	PEC	3	0	0	3	3
8.		Digital Image Processing	PEC	3	0	0	3	3

SEMESTER II, ELECTIVE II

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.		High Performance Computing for Big Data	PEC	3	0	0	3	3
2.		Information Retrieval Techniques	PEC	3	0	0	3	3
3.		Software Quality Assurance	PEC	3	0	0	3	3
4.		Autonomous Systems	PEC	3	0	0	3	3
5.		Web Analytics	PEC	3	0	0	3	3
6.		Cognitive Computing	PEC	3	0	0	3	3
7.		Quantum Computing	PEC	3	0	0	3	3
8.		Big Data Mining and Analytics	PEC	3	0	0	3	3

SEMESTER III, ELECTIVE III

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.		Mobile and Pervasive Computing	PEC	3	0	0	3	3
2.		Web Services and API Design	PEC	3	0	0	3	3
3.		Data Visualization Techniques	PEC	3	0	0	3	3
4.		Compiler Optimization Techniques	PEC	3	0	0	3	3
5.		Formal Models of Software Systems	PEC	3	0	0	3	3
6.		Robotics	PEC	3	0	0	3	3
7.		Natural Language Processing	PEC	2	0	2	4	3
8.		GPU Computing	PEC	3	0	0	3	3

SEMESTER III, ELECTIVE IV

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.		Devops and Microservices	PEC	3	0	2	5	4
2.		Mobile Application Development	PEC	3	0	2	5	4
3.		Deep Learning	PEC	3	0	2	5	4
4.		Block chain Technologies	PEC	3	0	2	5	4
5.		Embedded Software Development	PEC	3	0	2	5	4
6.		Full Stack Web Application Development	PEC	3	0	2	5	4
7.		Bioinformatics	PEC	3	0	2	5	4
8.		Cyber Physical Systems	PEC	3	0	2	5	4
9.		Mixed Reality	PEC	3	0	2	5	4

LIST OF OPEN ELECTIVES FOR PG PROGRAMMES

SL. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS
			L	T	P	
1.		Integrated Water Resources Management	3	0	0	3
2.		Water, Sanitation and Health	3	0	0	3
3.		Principles of Sustainable Development	3	0	0	3
4.		Environmental Impact Assessment	3	0	0	3
5.		Vibration and Noise Control Strategies	3	0	0	3
6.		Energy Conservation and Management in Domestic Sectors	3	0	0	3
7.		Additive Manufacturing	3	0	0	3
8.		Electric Vehicle Technology	3	0	0	3
9.		New Product Development	3	0	0	3
10.		Sustainable Management	3	0	0	3
11.		Micro and Small Business Management	3	0	0	3
12.		Intellectual Property Rights	3	0	0	3
13.		Ethical Management	3	0	0	3
14.		IoT for Smart Systems	3	0	0	3
15.		Machine Learning and Deep Learning	3	0	0	3
16.		Renewable Energy Technology	3	0	0	3
17.		Smart Grid	3	0	0	3
18.		Big Data Analytics	3	0	0	3
19.		Internet of Things and Cloud	3	0	0	3
20.		Medical Robotics	3	0	0	3
21.		Embedded Automation	3	0	0	3
22.		Environmental Sustainability	3	0	0	3
23.		Textile Reinforced Composites	3	0	0	3
24.		Nanocomposite Materials	3	0	0	3
25.		IPR, Biosafety and Entrepreneurship	3	0	0	3

SEMESTER – I SYLLABUS

	APPLIED PROBABILITY AND STATISTICS FOR COMPUTER SCIENCE ENGINEERS	L	T	P	C
		3	1	0	4

OBJECTIVES

To make the students conversant with the

- To encourage students to develop a working knowledge of the central ideas of Linear Algebra.
- To enable students to understand the concepts of Probability and Random Variables.
- To understand the basic probability concepts with respect to two dimensional random variables along with the relationship between the random variables and the significance of the central limit theorem.
- To apply the small / large sample tests through Tests of hypothesis.
- To enable the students to use the concepts of multivariate normal distribution and• principal components analysis.

UNIT - I	LINEAR ALGEBRA	7+3
Vector spaces – norms – Inner Products – Eigenvalues using QR transformations – QR factorization – generalized eigenvectors – Canonical forms – singular value decomposition and applications – pseudo inverse – least square approximations.		**CO1**
UNIT - II	PROBABILITY AND RANDOM VARIABLES	7+3
Probability – Axioms of probability – Conditional probability – Baye's theorem – Random variables – Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson , Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a random variable.		**CO2**
UNIT - III	TWO DIMENSIONAL RANDOM VARIABLES	7+3
Joint distributions – Marginal and conditional distributions – Functions of two-dimensional random variables – Regression curve – Correlation.		**CO3**
UNIT - IV	TESTING OF LARGE SAMPLING HYPOTHESIS	7+3
Sampling distributions – Type I and Type II errors – Test of Hypothesis - test of significance - Large samples - Z test - single proportion - difference of proportions - Single mean - difference of means.		**CO4**
UNIT - V	TESTING OF SMALL SAMPLING HYPOTHESIS	7+3
Small samples - Student's t test - single mean - difference of means -Test of variance - Fisher's test - Chi square test - goodness of fit - independence of attributes.		**CO5**
UNIT - VI	MULTIVARIATE ANALYSIS	7+3
Random vectors and matrices – Mean vectors and covariance matrices – Multivariate normal density and its properties – Principal components – Population principal components – Principal components from standardized variables		**CO6**
		TOTAL:60 PERIODS

REFERENCE BOOKS

1. Dallas E Johnson, "Applied multivariate methods for data Analysis", Thomson and Duxbury press, Singapore, 1998.
2. Richard A. Johnson and Dean W. Wichern, "Applied multivariate statistical Analysis", Pearson Education, Fifth Edition, 6th Edition, New Delhi, 2013.
3. Bronson, R.,"Matrix Operation" Schaum's outline series, Tata McGraw Hill, New York, 2011.
4. Oliver C. Ibe, "Fundamentals of Applied probability and Random Processes", Academic Press, Boston, 2014.
5. 5. Johnson R. A. and Gupta C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson India Education, Asia, 9th Edition, New Delhi, 2017.

ADVANCED DATA STRUCTURES AND ALGORITHMS

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the usage of algorithms in computing
- To learn and use hierarchical data structures and its operations
- To learn the usage of graphs and its applications
- To learn the usage of hashing techniques and collision handling
- To select and design data structures and algorithms that is appropriate for problems
- To study about NP Completeness of problems.

UNIT I - ROLE OF ALGORITHMS IN COMPUTING & COMPLEXITY ANALYSIS 8

Algorithms - Algorithms as a Technology - Time and Space complexity of algorithms - Asymptotic Analysis - Average and worst-case analysis - Asymptotic Notation - Importance of efficient algorithms - Program performance measurement - Recurrences: The Substitution Method - The Recursion - Tree Method - Data structures and algorithms.

UNIT II - HIERARCHICAL DATA STRUCTURES 8

Binary Search Trees: Basics - Querying a Binary search tree - Insertion and Deletion - Red Black trees: Properties of Red-Black Trees - Rotations - Insertion - Deletion - B-Trees: Definition of B- Trees - Basic operations on B-Trees - Deleting a key from a B-Tree - Heap - Heap Implementation - Disjoint Sets - Fibonacci Heaps: structure - Mergeable-heap operations - Decreasing a key and deleting a node-Bounding the maximum degree.

UNIT III - GRAPHS 8

Elementary Graph Algorithms: Representations of Graphs - Breadth-First Search - Depth-First Search - Topological Sort - Strongly Connected Components - Minimum Spanning Trees: Growing a Minimum Spanning Tree - Kruskal and Prim - Single-Source Shortest Paths: The Bellman-Ford algorithm - Single-Source Shortest Paths in Directed Acyclic Graphs - Dijkstra's Algorithm; Dynamic Programming - All-Pairs Shortest Paths: Shortest Paths and Matrix Multiplication - The Floyd-Warshall Algorithm.

UNIT IV: HASHING TECHNIQUES 8

Introduction to Hashing: Hash Functions - Properties of Good Hash Functions - Hash Tables: Open Addressing (Linear Probing, Quadratic Probing) - Separate Chaining - Applications and Performance: Handling Collisions - Dynamic Resizing

UNIT V - ALGORITHM DESIGN TECHNIQUES 7

Dynamic Programming: Matrix - Chain Multiplication - Elements of Dynamic Programming - Longest Common Subsequence - Greedy Algorithms: - Elements of the Greedy Strategy - An Activity-Selection Problem - Huffman Coding.

UNIT VI - NP COMPLETE AND NP HARD 6

NP-Completeness: Polynomial Time - Polynomial - Time Verification - NP-Completeness and Reducibility - NP-Completeness Proofs - NP-Complete Problems.

TOTAL : 45 PERIODS

SUGGESTED ACTIVITIES:

1. Write an algorithm for Towers of Hanoi problem using recursion and analyze the complexity (No of disc-4)
2. Write any one real time application of hierarchical data structure
3. Write a program to implement Make_Set, Find_Set and Union functions for Disjoint Set Data Structure for a given undirected graph G(V,E) using the linked list representation with simple implementation of Union operation
4. Find the minimum cost to reach last cell of the matrix from its first cell 5. Discuss about any NP completeness problem

COURSE OUTCOMES:

CO1: Design data structures and algorithms to solve computing problems.

CO2: Choose and implement efficient data structures and apply them to solve problems.

CO3: Design algorithms using graph structure and various string-matching algorithms to solve real-life problems.

CO4: Apply suitable collision handling techniques.

CO5: Design one's own algorithm for an unknown problem.

CO6: Apply suitable design strategy for problem solving.

REFERENCES

1. S.Sridhar," Design and Analysis of Algorithms", Oxford University Press, 1st Edition, 2014.
2. Adam Drozdex, "Data Structures and algorithms in C++", Cengage Learning, 4th Edition, 2013.
3. T.H. Cormen, C.E.Leiserson, R.L. Rivest and C.Stein, "Introduction to Algorithms", Prentice Hall of India, 3rd Edition, 2012.
4. Mark Allen Weiss, "Data Structures and Algorithms in C++", Pearson Education, 3rd Edition, 2009.
5. E. Horowitz, S. Sahni and S. Rajasekaran, "Fundamentals of Computer Algorithms", University Press, 2nd Edition, 2008.
6. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.

ADVANCED SOFTWARE ENGINEERING

L T P C

3 0 0 3

COURSE OBJECTIVES:

- To understand the rationale for software development process models
- To understand why the architectural design of software is important;
- To understand the important dimensions of dependability, namely, availability,reliability, safety, security, and resilience.
- To understand the dimensions of security, and resilience.
- To understand the basic notions of a web service, web service standards, and service-oriented architecture;
- To understand the different stages of testing from testing during development of a softwaresystem

UNIT I SOFTWARE PROCESS &MODELING 8

Prescriptive Process Models – Agility and Process – Scrum – XP – Kanban – DevOps – Prototype Construction – Prototype Evaluation – Prototype Evolution – Modelling – Principles – Requirements Engineering – Scenario-based Modelling – Class-based Modelling – Functional Modelling – Behavioural Modelling.

UNIT II SOFTWARE DESIGN 6

Design Concepts – Design Model – Software Architecture – Architectural Styles – Architectural Design – Component-Level Design – User Experience Design – Design for Mobility – Pattern- Based Design.

UNIT III SYSTEM DEPENDABILITY 8

Dependable Systems – Dependability Properties – Socio technical Systems – Redundancy and Diversity – Dependable Processes – Formal Methods and Dependability – Reliability Engineering – Availability and Reliability – Reliability Requirements – Fault-tolerant Architectures – Programming for Reliability – Reliability Measurement – Safety Engineering – Safety-critical Systems – Safety Requirements – Safety Engineering Processes – Safety Cases.

UNIT IV SYSTEM SECURITY 7

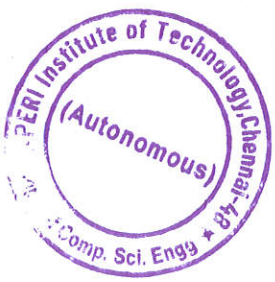
Security Engineering – Security and Dependability – Safety and Organizations – Security Requirements – Secure System Design –Security Testing and Assurance – Resilience Engineering – Cyber security – Socio technical Resilience – Resilient Systems Design.

UNIT V SERVICE-ORIENTED SOFTWARE ENGINEERING, SYSTEMS ENGINEERING AND REAL-TIME SOFTWARE ENGINEERING 8

Service-oriented Architecture – RESTful Services – Service Engineering – Service Composition – Systems Engineering – Socio technical Systems – Conceptual Design – System Procurement – System Development – System Operation and Evolution – Real-time Software Engineering – Embedded System Design – Architectural Patterns for Real-time Software – Timing Analysis – Real-time Operating Systems.

UNIT VI SOFTWARE TESTING AND SOFTWARE CONFIGURATION MANAGEMENT 8

Software Testing Strategy – Unit Testing – Integration Testing – Validation Testing – System Testing – Debugging – White-Box Testing – Basis Path Testing – Control Structure Testing – Black-Box Testing – Software Configuration Management (SCM) – SCM Repository – SCM Process – Configuration Management for Web and Mobile Apps.



SUGGESTED ACTIVITIES

1. Comparatively analyzing different Agile methodologies.
2. Describing the scenarios where 'Scrum' and 'Kanban' are used.
3. Mapping the data flow into suitable software architecture.
4. Developing behavioral representations for a class or component.
5. Implementing simple applications as RESTful service.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

The Students will be able to

CO1: Identify appropriate process models based on the Project requirements

CO2:Understand the importance of having a good Software Architecture.

CO3:Understand the important dimensions of dependability, namely, availability, reliability, safety, security, and resilience.

CO4: :Understand dimensions security, and resilience.

CO5: Understand the basic notions of a web service, web service standards, and service-oriented architecture;

CO6:Be familiar with various levels of Software testing

REFERENCES:

1. Software Engineering: A Practitioner's Approach, 9th Edition. Roger Pressman and Bruce Maxim, McGraw-Hill 2019.
2. Software Engineering, 10th Edition, Ian Somerville, Pearson Education Asia 2016.
3. Software Architecture In Practice, 3rd Edition, Len Bass, Paul Clements and Rick Kazman, Pearson India 2018
4. An integrated approach to Software Engineering, 3rd Edition, Pankaj Jalote, Narosa Publishing House, 2018
5. Fundamentals of Software Engineering, 5th Edition, Rajib Mall, PHI Learning Private Ltd, 2018

NETWORK TECHNOLOGIES

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the basic concepts of networks
- To explore various network topologies
- To learn about network addressing
- To study about wireless networks
- To learn about 4G and 5G networks
- To understand the paradigm of Software defined networks

UNIT I NETWORKING FUNDAMENTALS 8

Peer to Peer vs. Client-Server Networks: Architecture, advantages, and use cases-Network Terminology: Bandwidth, latency, throughput, etc-Network Speeds & Throughput/Delay: Network speed, data transfer rates, and delay factors-OSI Model: The seven layers of the OSI model and their functions-Packets, Frames, and Headers: Data packaging for network transmission

UNIT II NETWORK DEVICES AND TOPOLOGIES 8

Network Devices: Overview of devices like switches, routers, and firewalls-Collision and Broadcast Domains: Definitions and differences in network domains-LAN vs. WAN: Comparison between Local Area Networks and Wide Area Networks-Network Adapter, Hub, Switch, Router, Firewall: Roles and functions of these devices.

UNIT III IP NETWORKING AND ADDRESSING 6

IP Addressing: Basics of IP addressing, including IPv4 and IPv6-Network Topologies: Star, bus, ring, and mesh topologies-Network Segmentation: VLANs and subnets-Routing and Switching: Basic concepts of routing and switching

UNIT IV WIRELESS NETWORKS 7

Wireless Access Techniques: IEEE 802.11 standards (802.11a, 802.11g, 802.11n/ac/ax/ay/ba/be) - Quality of Service (QoS): Importance of QoS in wireless networks-Bluetooth: Protocol stack, security, and profiles-Zigbee: Technology and applications in wireless communication.

UNIT V MOBILE DATA NETWORKS 8

4G Networks and Composite Radio Environment: 4G network architecture-Protocol Boosters: Enhancements to standard protocols-Hybrid 4G Wireless Networks Protocols: Integration of different network types-Green Wireless Networks: Energy-efficient wireless designs-Physical

Layer and Multiple Access: Physical layer and multiple access in mobile networks-Channel Modelling for 4G: Techniques specific to 4G-Concepts of 5G: Introduction to 5G networks, including channel access and air interface-Cognitive Radio and Spectrum Management: Cognitive radio for spectrum management.

UNIT VI ADVANCED NETWORKING TECHNOLOGIES 8

C-RAN Architecture: Cloud Radio Access Networks-Vehicular Communications Protocol: Vehicle-to-everything (V2X) communication protocols-Network Slicing: Network slicing in 5G-MIMO and mmWave: Multiple Input Multiple Output and millimeter-wave technologies-Introduction to 6G: Emerging concepts in 6G networks-Software Defined Networks (SDN): SDN architecture, OpenFlow protocol, control and data plane functions-Network Functions Virtualization (NFV): NFV architecture, virtualized network functions, and management-Network Virtualization (VLAN and VPN): VLAN and VPN concepts in NFV.

TOTAL : 45 PERIODS

SUGGESTED ACTIVITIES:

1. Execute various network utilities such as trace, path, ping, ipconfig
2. Implement the Software Defined Networking using Mininet
3. Implement routing in Mininet
4. Install a virtual machine and study network virtualization
5. Simulate various network topologies in Network Simulator

COURSE OUTCOMES:

CO1: Explain basic networking concepts, including network topologies, devices, and the OSI model.

CO2: Compare different networking models and protocols, including peer-to-peer, client-server, and IP addressing schemes.

CO3: Analyze and compare various wireless networking protocols, including Wi-Fi standards, Bluetooth, and ZigBee.

CO4: Describe the developments and advancements in each generation of mobile data networks from 4G to 6G.

CO5: Explain and design Software-Defined Networking (SDN) based applications, including the use of OpenFlow and network abstraction layers.

CO6: Discuss and implement the concepts of Network Functions Virtualization (NFV), including its architecture, benefits, and use cases.

REFERENCES

1. James Bernstein, "Networking made Easy", 2018. (UNIT I)

2. HoudaLabiod, Costantino de Santis, HossamAfifi "Wi-Fi, Bluetooth, Zigbee and WiMax", Springer 2007 (UNIT 2)

3. Erik Dahlman, Stefan Parkvall, Johan Skold, 4G: LTE/LTE-Advanced for Mobile Broadband, Academic Press, 2013 (UNIT 3)

4. Saad Z. Asif "5G Mobile Communications Concepts and Technologies" CRC press – 2019 (UNIT 3)

5. William Stallings "Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud" 1st Edition, Pearson Education, 2016.(Unit 4 and 5)

6. Thomas D.Nadeau and Ken Gray, SDN – Software Defined Networks, O"Reilly Publishers, 2013.

7. Guy Pujolle, "Software Networks", Second Edition, Wiley-ISTE, 2020

CO-PO Mapping

CO	POs											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	1	-	-	2	-	1	-	-	2	1
2	3	3	2	-	-	1	1	2	-	1	3	1
3	3	3	3	2	-	-	2	3	1	1	2	-
4	3	2	2	1	-	3	-	2	-	-	3	2
5	3	3	3	2	2	3	1	3	1	1	2	2
6	3	2	3	3	2	3	2	3	1	2	3	2

DATABASE PRACTICES

L	T	P	C
3	0	0	3

UNIT I RELATIONAL DATA MODEL 8

Entity Relationship Model – Relational Data Model – Mapping Entity Relationship Model to Relational Model – Relational Algebra – Structured Query Language – Database Normalization

UNIT II DISTRIBUTED DATABASES, ACTIVE DATABASES 8

Distributed Database Architecture – Distributed Data Storage – Distributed Transactions – Distributed Query Processing – Distributed Transaction Management – Event Condition Action Model – Design and Implementation Issues for Active Databases – Open Database Connectivity

UNIT III XML DATABASES 7

Structured, Semi structured, and Unstructured Data – XML Hierarchical Data Model – XML Documents – Document Type Definition – XML Schema – XML Documents and Databases – XML Querying – XPath – XQuery

UNIT IV NOSQL DATABASES 8

NoSQL – Categories of NoSQL Systems – CAP Theorem – Document-Based NoSQL Systems and MongoDB – MongoDB Data Model – MongoDB Distributed Systems Characteristics – NoSQL Key-Value Stores – DynamoDB Overview – Voldemort Key-Value Distributed Data Store – Wide Column NoSQL Systems – Hbase Data Model – Hbase Crud Operations – Hbase Storage and Distributed System Concepts – NoSQL Graph Databases and Neo4j – Cypher Query Language of Neo4j – Big Data – MapReduce – Hadoop – YARN.

UNIT V DATABASE SECURITY 8

Database Security Issues – Discretionary Access Control Based on Granting and Revoking Privileges – Mandatory Access Control and Role-Based Access Control for Multilevel Security – SQL Injection – Statistical Database Security – Flow Control – Encryption and Public Key Infrastructures – Preserving Data Privacy – Challenges to Maintaining Database Security – Database Survivability – Oracle Label-Based Security.

UNIT VI DATA MINING 6

Overview of data mining technology (associated rules, classification, clustering), applications of data mining; Data Warehousing: Overview of data warehousing, typical functionality of a data warehouse

TOTAL : 45 PERIODS

COURSE OUTCOMES

At the end of the course, students will be able to

CO1: Convert the ER-model to relational tables, populate relational databases and formulate SQL queries on data.

CO2: Understand and write well-formed XML documents

CO3: Be able to apply methods and techniques for distributed query processing.

CO4: Design and Implement secure database systems.

CO5: Use the data control, definition, and manipulation languages of the NoSQL databases

CO6: Understand and adopt the concepts of datamining in database.

REFERENCES

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education 2016

2. Henry F. Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2019

3.C.J. Date, A.Kannan, S.Swamynathan, —An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006

4. Raghu Ramakrishnan, Johannes Gehrke "Database Management Systems", Fourth Edition, McGraw Hill Education, 2015.

5. Harrison, Guy, "Next Generation Databases, NoSQL and Big Data" , First Edition, Apress publishers, 2015

6. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Sixth Edition, Pearson Education, 2015

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	3	2	1	-	-	2	-	3	-	1
CO2	2	2	2	2	2	-	-	-	-	-	-	-
CO3	2	1	1	3	2	-	-	-	-	-	-	-
CO4	3	3	3	3	3	-	-	-	-	-	-	-
CO5	3	3	1	2	1	-	-	-	-	-	-	-
CO6	2	1	1	4	2	-	-	-	-	1	-	-

ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY

L T P C

0 0 4 2

COURSE OBJECTIVES:

- To acquire the knowledge of using advanced tree structures
- To learn the usage of heap structures
- To understand the usage of graph structures and spanning trees
- To understand the problems such as matrix chain multiplication, activity selection and Huffman coding
- To understand the necessary mathematical abstraction to solve problems.

LIST OF EXPERIMENTS:

1: Implementation of recursive function for tree traversal and Fibonacci
2: Implementation of iteration function for tree traversal and Fibonacci
3: Implementation of Merge Sort and Quick Sort
4: Implementation of a Binary Search Tree
5: Red-Black Tree Implementation
6: Heap Implementation
7: Fibonacci Heap Implementation
8: Graph Traversals
9: Spanning Tree Implementation
10: Shortest Path Algorithms (Dijkstra's algorithm, Bellman Ford Algorithm)
11: Implementation of Matrix Chain Multiplication
12: Activity Selection and Huffman Coding Implementation

HARDWARE / SOFTWARE REQUIREMENTS

1. 64-bit Open source Linux or its derivative
2. Open Source C++ Programming tool like G++/GCC

TOTAL : 30 PERIODS

COURSE OUTCOMES:

CO1: Design and implement basic and advanced data structures extensively

CO2: Design algorithms using graph structures.

CO3: Design and develop efficient algorithms with minimum complexity using design techniques

CO4: Develop programs using various algorithms.

CO5: Choose appropriate data structures and algorithms, understand the ADT/libraries and use it to design algorithms for a specific problem.

SOFTWARE ENGINEERING LABORATORY L T P C
0 0 4 2

LAB OBJECTIVE:

The Software Engineering Lab has been developed by keeping in mind the following objectives:

- To impart state-of-the-art knowledge on Software Engineering and UML in an interactive manner through the Web.
- Present case studies to demonstrate practical applications of different concepts.
- Provide a scope to students where they can solve small, real-life problems.

LIST OF EXPERIMENTS:

1. Write a Problem Statement to define a title of the project with bounded scope of project
2. Select relevant process model to define activities and related task set for assigned project
3. Prepare broad SRS (Software Requirement Specification) for the above selected projects
4. Prepare USE Cases and Draw Use Case Diagram using modelling Tool
5. Develop the activity diagram to represent flow from one activity to another for software development
6. Develop data Designs using DFD Decision Table & ER Diagram.
7. Draw class diagram, sequence diagram, Collaboration Diagram, State Transition Diagram for the assigned project
8. Write Test Cases to validate requirements of assigned project from SRS Document
9. Evaluate Size of the project using function point metric for the assigned project
10. Estimate cost of the project using COCOMO and COCOCMOII for the assigned project
11. Use CPM/PERT for scheduling the assigned project
12. Use timeline Charts or Gantt Charts to track progress of the assigned project.

TOTAL:30 PERIODS

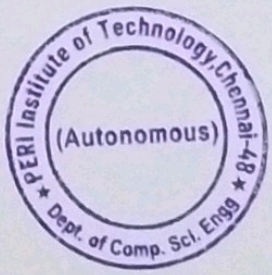
LAB OUTCOME:

CO1: Can produce the requirements and use cases the client wants for the software being produced.

CO2: Participate in drawing up the project plan. The plan will include at least extent and work assessments of the project, the schedule, available resources, and risk management can model and specify the requirements of mid-range software and their architecture.

CO3: create and specify such a software design based on the requirement specification that the software can be implemented based on the design.

CO4: Can assess the extent and costs of a project with the help of several different assessment methods.



SEMESTER – II SYLLABUS

RESEARCH METHODOLOGY

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Understand the formulation of research problem
- Be familiar with data collection and literature survey process
- Know the statistical concepts in experimentation
- Acquire knowledge in writing research proposal
- Be familiar with online academic databases
- Understand the process of plagiarism

UNIT I: RESEARCH DESIGN 8

Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys

UNIT II: DATA COLLECTION AND SOURCES 8

Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods. Data - Preparing, Exploring, examining and displaying.

UNIT III: SAMPLING 8

Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non-Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size

UNIT IV: DATA ANALYSIS AND REPORTING 7

Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation

UNIT V: ACADEMIC DATABASES 7

Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline

UNIT VI: PLAGIARISM 7

Use of tools / techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism

TOTAL : 45 PERIODS

COURSE OUTCOMES

At the end of the course, students will be able to

CO1: Identify research problem
CO2: Collect suitable data for research
CO3: prepare suitable data for research
CO4: Write research proposals and reports
CO5: apply the online academic databases for research
CO6: Use the different plagiarism tools

TEXT BOOKS

1. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition.
2. Business Research Methods – Alan Bryman & Emma Bell, Oxford University Press 3

REFERENCES (Minimum 3)

1.Research Methodology – C.R. Kothari.

2. Cooper, D.R., Schindler, P.S. and Sun, J., 2006. Business research methods (Vol. 9). New York: McGraw-Hill Irwin.

3. Creswell, J.W. and Creswell, J.D., 2017. Research design: Qualitative, quantitative, and mixed methods approach. Sage publications.

4.Kothari, C.R., 2004. Research methodology: Methods and techniques. New Age International.

5.Krishnaswamy, K.N., 2006. Management Research Methodology: Integration of Principles, Methods and Techniques. Pearson Education India

6.Sekaran, U. and Bougie, R., 2016. Research methods for business: A skill building approach. John Wiley &Sons

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3						
CO2	3	3	3	3	3	3						
CO3	3	3	3	3	3	3						
CO4	3	3	3	3	3	3						
CO5	3	3	3	3	3	3						
CO6	3	3	3	3	3	3						

INTERNET OF THINGS

L T P C
3 0 0 3

COURSEOBJECTIVES:

- To understand the Architectural Overview of IoT
- To understand the IoT Reference Architecture and Real World Design Constraints
- To understand the various IoT levels
- To understand the basics of cloud architecture
- To gain experience in Raspberry PI and experiment simple IoT application on it
- To apply the concept of Internet of Things in the real-world scenario

UNIT I INTRODUCTION 8

Internet of Things- Domain Specific IoTs - IoT and M2M-Sensors for IoT Applications–Structure of IoT– IoT Map Device- IoT System Management with NETCONF-YANG

UNIT II IoT ARCHITECTURE, GENERATIONS AND PROTOCOLS 8

IETF architecture for IoT - IoT reference architecture -First Generation – Description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics

UNIT III IoT PROTOCOLS AND TECHNOLOGY 8

SCADA and RFID Protocols - BACnet Protocol -Zigbee Architecture - 6LowPAN - CoAP - Wireless Sensor Structure–Energy Storage Module–Power Management Module–RF Module–Sensing Module

UNIT IV CLOUD ARCHITECTURE BASICS 7

The Cloud types; IaaS, PaaS, SaaS.- Development environments for service development; Amazon, Azure, Google App cloud platform in industry

UNIT V IOT PROJECTS ON RASPBERRY PI 7

Building IOT with RASPBERRY PI- Creating the sensor project - Preparing Raspberry Pi - Clayster libraries – Hardware Interacting with the hardware - Interfacing the hardware- Internal representation of sensor values - Persisting data - External representation of sensor values - Exporting sensor data.

UNIT VI IOT APPLICATIONS 7

Applications of IoT in Agriculture, Logistics, Smart home, Health and Energy - IoT applications for industry: Future Factory Concepts, Brownfield IoT.

TOTAL:45 PERIODS

COURSEOUTCOMES:

CO1: Understand the various concept of the IoT and their technologies.

CO2: Develop the IoT application using different hardware platforms.

CO3: Implement the various IoT Protocols.

CO4: Understand the basic principles of cloud computing.

CO5: Develop and deploy the IoT application into raspberry.

CO6: Deploy an IoT application and connect to the cloud.

TEXT BOOKS:

1. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press,2012.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet ofThings", Springer, 2011
3. David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a HighlyConnected World", Cambridge University Press, 2010.
4. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012.

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, Internet of Things: A hands-on approach, Universities Press, 2015.
2. Dieter Uckelmann, Mark Harrison, Florian Michahelles (Eds), Architecting the Internet ofThings, Springer, 2011.
3. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015
4. Ovidiu Vermesan Peter Friess, 'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014.
5. N. Ida, Sensors, Actuators and Their Interfaces: A Multidisciplinary Introduction, 2nd Edition Scitech Publishers,2024 14.

CO's-PO's MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	1	1	3	-	-	-	-	-	-
CO2	3	2	1	2	3	2	-	-	-	-	-	-
CO3	1	1	2	1	3	3	-	-	-	-	-	-
CO4	2	3	2	1	2	2	-	-	-	-	-	-
CO5	1	2	1	2	1	1	-	-	-	-	-	-
CO6	1	2	3	3	3	3	-	-	-	-	-	-

MACHINE LEARNING

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the concepts and mathematical foundations of machine learning and types of problems tackled by machine learning.
- To explore the different supervised learning techniques including ensemble methods.
- To learn different aspects of unsupervised learning and reinforcement learning.
- To learn the role of probabilistic methods for machine learning.
- To understand the basic concepts of neural networks
- To understand the basic concepts of deep learning

UNIT I INTRODUCTION AND MATHEMATICAL FOUNDATIONS 8

What is Machine Learning? Need –History – Definitions – Applications - Advantages, Disadvantages & Challenges - Types of Machine Learning Problems – Mathematical Foundations - Linear Algebra & Analytical Geometry - Probability and Statistics- Bayesian Conditional Probability -Vector Calculus & Optimization - Decision Theory - Information theory

UNIT II SUPERVISED LEARNING 8

Introduction-Discriminative and Generative Models -Linear Regression - Least Squares -Under-fitting / Overfitting - Cross-Validation – Lasso Regression- Classification - Logistic Regression- Gradient Linear Models -Support Vector Machines –Kernel Methods -Instance based Methods - K-Nearest Neighbors - Tree based Methods –Decision Trees – ID3 – CART - Ensemble Methods –Random Forest - Evaluation of Classification Algorithms

UNIT III UNSUPERVISED LEARNING AND REINFORCEMENT LEARNING 8

Introduction - Clustering Algorithms -K – Means – Hierarchical Clustering - Cluster Validity - Dimensionality Reduction –Principal Component Analysis – Recommendation Systems - EM algorithm. Reinforcement Learning – Elements -Model based Learning – Temporal Difference Learning

UNIT IV PROBABILISTIC METHODS FOR LEARNING 8

Introduction -Naïve Bayes Algorithm -Maximum Likelihood -Maximum Apriori -Bayesian Belief Networks - Probabilistic Modelling of Problems -Inference in Bayesian Belief Networks – Probability Density Estimation - Sequence Models – Markov Models – Hidden Markov Models

UNIT V NEURAL NETWORKS 7

Neural Networks – Biological Motivation- Perceptron – Multi-layer Perceptron – Feed Forward Network – Back Propagation- gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks- Activation and Loss Functions- Limitations of Machine Learning. Natural Language Processing – Computer Vision – Speech Recognition – Recommender Systems.

UNIT VI – DEEP LEARNING 7

Deep Learning– Convolution Neural Networks – Recurrent Neural Networks – Model Evaluation – Auto encoders And Generative Models- Deep Generative Models: Variational auto encoders – Generative adversarial networks.-Use cases

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon the completion of course, students will be able to

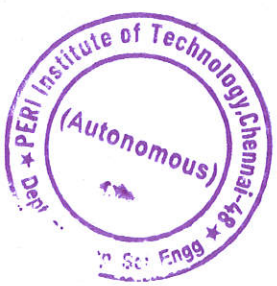
CO1: Understand and outline problems for each type of machine learning
CO2: Design a Decision tree and Random forest for an application
CO3: Implement Probabilistic Discriminative and Generative algorithms for an application andanalyze the results.
CO4: Use a tool to implement typical Clustering algorithms for different types of applications.
CO5: Design and implement an application and identify applications using neural networks.
CO6: implement an application using deep learning

REFERENCES

1. Stephen Marsland, "Machine Learning: An Algorithmic Perspective", Chapman & Hall/CRC,2nd Edition, 2014.
2. Kevin Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012
3. Ethem Alpaydin, "Introduction to Machine Learning", Third Edition, Adaptive Computation andMachine Learning Series, MIT Press, 2014
4. Tom M Mitchell, "Machine Learning", McGraw Hill Education, 2013.
5. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data",First Edition, Cambridge University Press, 2012.

CO's & PO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	1	3	1	1	-	-	-	-	-	-
CO2	2	3	1	2	1	2	-	-	-	-	-	-
CO3	1	1	2	1	-	2	-	-	-	-	-	-
CO4	2	2	-	-	-	3	-	-	-	-	-	-
CO5	3	3	1	1	1	3	-	-	-	-	-	-
CO6	3	3	1	1	1	3	-	-	-	-	-	-



BIG DATA ANALYTICS

L T P C

3 0 0 3

COURSE OBJECTIVES:

- Understand the Big Data Platform and its Use cases
- Provide an overview of Apache Hadoop
- Provide HDFS Concepts and Interfacing with HDFS
- Understand Map Reduce Jobs
- Provide hands on Hadoop Eco System
- Exposure to Data Analytics with R.

UNIT I INTRODUCTION TO BIG DATA 8

Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analyzing Data with Unix tools, Analyzing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere Big Insights and Big Sheets.

UNIT II HDFS (HADOOP DISTRIBUTED FILE SYSTEM) MAP REDUCE 8

HDFS (Hadoop Distributed File System) The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures

UNIT III MAP REDUCE 7

Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

Unit IV HADOOP ECO SYSTEM PIG 8

Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive: Hive Shell, Hive Services, Hive Meta store, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. HBase: HBasics, Concepts, Clients, Example, HBase Versus RDBMS. Big SQL: Introduction

UNIT V GETTING STARTED WITH R 7

Installing R - The R environment - R packages - Basics of R - Data Structures - Reading data into R - Graphics in R. Writing R functions - Control Statements (if and else, switch, if else, compound tests) - Loops in R (for, while, controlling loops) - Applications using the functions and loops.

UNIT VI DATA MANIPULATION AND ANALYSIS 7

Group manipulation - Data Reshaping - Manipulating Strings - Basic Statistics using R (Summaries, Correlation, t-tests, ANOVA)- Linear Models - Simple and Multiple regression, GLM - Logit Regression, Model diagnostics - Residuals, Cross validation, Boot strapping

TOTAL: 45 PERIODS

COURSE OUTCOMES

At the end of the course, students will be able to

CO1: Identify Big Data and its Business Implications
CO2: List the components of Hadoop and Hadoop Eco-System.
CO3 Access and Process Data on Distributed File System.
CO4: Manage Job Execution in Hadoop Environment.
CO5: Develop Big Data Solutions using Hadoop Eco System:
CO6: Gain basic Knowledge about the R language and apply statistical computing techniques and graphics for analyzing big data

TEXT BOOKS

1.Tom White "Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.
3.Sandip Rakshit, R Programming for Beginners, McGraw Hill Education, 2017.
4. R Programming An Approach to Data Analytics by G.Sudhamathy, MJP Publications,2021

REFERENCES (Minimum 3)

1.Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.

2.Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)

3.Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press

4. Anand Rajaraman and Jefrey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012

5. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.

6.Glen J. Myat, "Making Sense of Data", John Wiley & Sons, 2007

7. Pete Warden, "Big Data Glossary", O'Reily, 2011.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1		1	1							1
CO2	2	1	2	2	3						2	3
CO3	2	1	2	2	3						2	3
CO4	2	1	2	2	3						3	3
CO5	2	2	3	2	3						3	3
CO6	2	2	3	3	3						3	3

PERI Institute of Technology, Chennai-48 (Autonomous) Dept. of Comp. Sci. Engg

CHAIRMAN
Board of Studies
Department of CSE
PERI Institute of Technology
(An Autonomous Insti...tion)
Mannivakkam, ...8.

DATA ANALYTICS LABORATORY

L T P C

0 0 4 2

COURSE OBJECTIVES:

- To develop data analytic code in python
- To be able to use python libraries for handling data
- To develop analytical applications using python
- To perform data visualization using plots

LIST OF EXPERIMENTS

Tools: Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh

Working with Numpy arrays

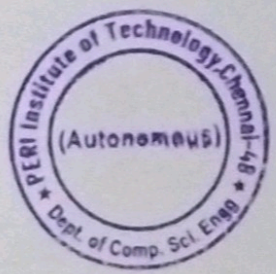
1. Working with Pandas data frames
2. Basic plots using Matplotlib
3. Frequency distributions, Averages, Variability
4. Normal curves, Correlation and scatter plots, Correlation coefficient
5. Regression
6. Z-test
7. T-test
8. ANOVA
9. Building and validating linear models
10. Building and validating logistic models
11. Time series analysis

TOTAL: 30 PERIODS

COURSE OUTCOMES:

Upon successful completion of this course, students will be able to:

CO1. Write python programs to handle data using Numpy and Pandas
CO2. Perform descriptive analytics
CO3. Perform data exploration using Matplotlib
CO4. Perform inferential data analytics
CO5. Build models of predictive analytics



MACHINE LEARNING LABORATORY

L T P C

0 0 4 2

1. Implement a Linear Regression with a Real Dataset (https://www.kaggle.com/harrywang/housing). Experiment with different features in building a model. Tune the model's hyper parameters.

2. Implement a binary classification model. That is, answers a binary question such as "Are houses in this neighborhood above a certain price?" (use data from exercise 1). Modify the classification threshold and determine how that modification influences the model. Experiment with different classification metrics to determine your model's effectiveness.

3. Classification with Nearest Neighbors. In this question, you will use the scikit-learn's KNN classifier to classify real vs. fake news headlines. The aim of this question is for you to read the scikit-learn API and get comfortable with training/validation splits. Use California Housing Dataset

4. In this exercise, you'll experiment with validation sets and test sets using the dataset. Split a training set into a smaller training set and a validation set. Analyze deltas between training set and validation set results. Test the trained model with a test set to determine whether your trained model is overfitting. Detect and fix a common training problem.

5. Implement the k-means algorithm using https://archive.ics.uci.edu/ml/datasets/Codon+usage dataset

6. Implement the Naïve Bayes Classifier using https://archive.ics.uci.edu/ml/datasets/Gait+Classification dataset

7. Project - (in Pairs) Your project must implement one or more machine learning algorithms and apply them to some data.

CHAIRMAN
Board of Studies
Department of CSE
PERI Institute of Technology
(An Autonomous Institution)
Mannivakkam, Chennai - 48.

PERI Institute of Technology, Chennai-48 (Autonomous) Dept. of Comp Sci Engg